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Hybrid fuzzy methodology for the evaluation of criteria and sub-criteria of product-service system (PSS)

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Abstract

The world economy has seen the evolution of predominant economic activities. From pre-industrial society based on extractive activities (primary sector), through the industrial era characterized by the production of consumer goods (secondary sector), to the post-industrial age with predominance of the service sector (tertiary sector). In addition, more recently, it has been integrated with the products. i.e. PSS (Product-Service System) an integrated combination of products and services. A PSS can be thought of as a market proposition that extends the traditional functionality of a product by incorporating additional services. The primary aim of this paper is to evaluate the criteria and sub-criteria of the implementation of PSS (point of view of operations), based on the quality dimensions, through of hybrid methodology (Fuzzy Delphi – FDELPHI and Fuzzy Analytic Hierarchy Process – FAHP). The fuzzy Delphi method was used to validate the criteria and sub-criteria taken from the literature. FAHP method to calculate the relative weights of the selected criteria and sub-criteria. The questionnaire (based on the quality dimensions) was applied to a large company located in Paraná, Brazil, which has the intention of implementing PSS. The results show that the criteria that were relevant to the company: C_3 (Restructuring) had the high weight (17.80%), C_9 (Assurance) (15.38%) and C_4 (Innovation and Technology) (13.26%). Regarding sub-criteria (global weight), the most influential are "Sc46 (learning and understanding of requirements of necessity and customer satisfaction) 5.55%), Sc_{14}, Sc_{15}, Sc_{17} and Sc_{18} (Restructuring) (3.54%, 3.35%, 3.30% and 3.00% respectively). Thus, this work is expected to contribute to improvement in the management of product-service system (PSS) innovation and to provide competitive advantages.

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Keywords: Services; fuzzy logic; innovation; quality dimensions

1. Introduction

The logic of this evolutionary process shows that the service society, characterized by intangibility of its products, directs you to a society based on experiences where the final product is being offered as required to experienced process. In the 1990s, new studies were conducted with the purpose of identifying evidence in the relationships of economic interdependence and procedural dynamics of innovation across sectors of industry and services. In this context, Product-Service System (PSS) is highlighted. Product-service systems (PSS) are a specific type of value proposition that a business (network) offers to (or co-produces with) its clients. One definition of PSS is 'a mix of tangible products and intangible services designed and combined so that they are jointly capable of fulfilling final customer needs' [1-2]. Therefore, this study aims to evaluate the criteria and sub-criteria of implementation of PSS (point of view of operations), based on the quality dimensions through of hybrid methodology (Fuzzy Delphi – FDELPHI and Fuzzy Analytic Hierarchy Process – FAHP). This paper is organized into five sessions. The context of the research is described in session 1. Session 2 explains the background; session 3 shows the methodology used. In session 4, its application and results (case study). Finally, in session 5 the conclusions.

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2. Background

The subsequent literature review addresses the PSS.

2.1. Product-Service System (PSS)

The union between products and services initially emerged as a way to create entry barriers to new competitors and increase the portfolio of customers of these companies, such as new products, but without much differentiation in manufacturing. The concept of "Servitization" [4-5] products, "Productization" [6] services and more recently the Product-Service System (PSS) or Integrated Product-Service System (IPS2).

Productization traditionally appeared in service companies such as banks, which started using products to facilitate and deliver their services. Subsequently, they were given a broader control over the design specifications of products used to produce and deliver the service. Productization [7] is the evolution of the services component to include a product or a new service component marketed as a product. Servitization is the innovation of an organization's capabilities and processes to better create mutual value through a transition from selling product to selling PSS.

The integration of goods and services brought challenges regarding product design, which began to be considered with a packaging or the offer of solutions. In this way, the production processes need to be rethought. This is also true for the delivery of the product. The product life cycle becomes a challenge considering that it will not add associated services. PSS is a business strategy, and has major potential to generate solutions that meet the needs of not only industry but also clients through the delivery of integrated products and services.

The PSS uses a new service structure to facilitate sustainable production and consumption [1], [8] and its effect is significant to the countries that are often a concern in industries that consume development resources [9] [10]. The PSS can be defined as a social system that increases social and economic values for stakeholders, by offering products, services and products-services within the system [11]. Hence, intensive forms of utilization of product are replaced by the possibility to fulfil consumers' needs through the provision of more dematerialized services, which are also often associated with changes in the ownership structure.

Therefore, various approaches and trends towards development and the PSS can be described as [12]:

- sale of the use of the product instead of the product itself;
- change to a 'leasing society';
- substitution of goods by means of service machines;
- repair-society instead of a throw-away society;
- change in consumer attitudes from sales to service orientation.

The concept PSS can have its typology divided into three main categories (PSS1, PSS2 or PSS3) or into eight subcategories, as proposed by [13].

- PSS1: Product-oriented services – the provider not only sells a product, but also offers services that are required during the use phase of the product. This can imply, for example, a maintenance contract, a financing scheme or the supply of consumables, but also a take-back agreement when the product reaches its end of life.
- PSS2: Use-oriented services – Here, the product does not move in ownership. The provider maintains ownership, and is often responsible for maintenance, repair and control [18]. The lease pays a regular fee for the use of the product; in this case he normally has unlimited and individual access to the leased product.
- PSS3: Result-oriented services – based on the provision of solution or a result of replacing only a tangible product. The companies offered a personal service or a product mix with ownership of the company (manufacturer or service provider). In addition, consumers pay only for results [7]. He/she does not use the product, only benefits from results of functions created by the product in use.

Many studies have explored how PSS can create the advantage of environmental sustainability [14-16], [17]. In PSS, the ultimate goal of adding services to traditional products lies in the achievement of sustainability [18]. Sustainability can be achieved through the transition towards functional economy by changing customers' behavior from product ownership to relevant function usage [19-22].

Through this change, the use of resources can be optimized by sharing or collectively utilizing the products or managing the product lifecycle. This resource optimization can be linked to the concept of dematerialization in PSS [23], which refers to the opportunity that a PSS offers to break the link between value delivered to the customers, and the amount of tangible material needed to create the value [7]. All these activities can contribute to reducing environmental impact, thus achieving sustainable development [15].

Therefore, it is possible to foresee a generation of service-oriented solutions [18] based on company-led innovations, shifting a company's focus from products to services. PSS has the potential to open new markets. In reality, if they are successful, it will be because the product service mix offered is recognized by the potential customers (companies or individual consumers) as better than existing solutions, or they are meeting previously answered demands.

3. Methodology

In this paper, the mathematical modeling was based on FDELPHI and FAHP hybrid methodology to assess the criteria and sub-criteria of implementation of PSS (from the point of view of operations), based on the quality dimensions. The use of a hybrid approach is justified: the Fuzzy method Delphi shows itself useful due to the fact the discussion with experts about what they want to work on, not counting the fact that this method provides a refinement in the search instruments (for example, in the questionnaire). As for the FAHP, this method is the most spreading in literature and the fuzzy logic compensates for its imprecision and uncertainty that originates in the judgment of the decision maker(s). Since the peer-to-peer

comparison in the AHP is inadequate, inaccurate and conventional, in capturing the degree of importance of the decision-maker(s) in the evaluation of alternatives.

A hybrid mathematical modeling was based on two steps: in the first place, decision-makers identify the problem, criteria and sub-criteria to the implementation of PSS, based on the quality dimensions (Table 1). The FDELPHI was used to validate criteria and sub-criteria present in the implementation of PSS and, FAHP method was applied to calculate the relative weights of the selected criteria/sub-criteria.

Table 1. Criteria researched literature.

Criteria	Authors
Tangible/Intangible	Baines et. al. [7]; Parasuraman et al. [24] [25] [26]; Clayton et al. [27].
Costs	Kallenberg [28]; Gianese & Correa [29].
Organizational elements	Cook et al. [30]; Krucken & Meroni [31]
Innovation	Manzini & Vezzoli [19]; Tukker [13]; Hortelano & Gongález-Moreno [3].
Environmental Aspects	Roy [32]; Tukker & Tischner (2006) [1]; Anttonen [33]; Guidat et al.b[34]; Reim et al. [16].
Technology	Hortelano & Gongález-Moreno [3]; Parasuraman [25] [35]; Parasuraman et al. [36].
Communication	Parasuraman et al. [24]; Toivonen [37].
Assurance	Parasuraman,et al. [24]; Mont [12].
Access	Parasuraman et al. [24].

Source: Prepared by the authors based on the literature

The initial Step I was conducted through the fuzzy Delphi method with 5 expert implementation of PSS. As result of fuzzy Delphi method (see Chang & Wang [39], Kuo & Chen [40], Hsu et al. [41], Wang & Durugbo [42]), obtained a questionnaire validated by experts. Subsequently, this was applied to a large company situated in the central region of Paraná, Brazil. The company is planning to implement PSS. The study is characterized as a case study. In Step II, a matrix of pair wise comparison was built. Through the FAHP method proposed by Chang [38], the vector of weights of paired array was determined.

The fuzzy triangular scale of preference used in this study is given in Table 2. For it, the approach Wang, Chan and Li [44] was used. The use of this method is due to the fact that the steps of this approach are similar to the conventional AHP and are considered relatively easier than other FAHP approaches.

Table 2. Relationship between linguistic variables and their relevance functions.

Rating level	Linguistic values	TFNs	Triangular fuzzy reciprocal scale
1	Equal	(1, 1, 1)	(1,1,1)
3	Moderately more important	(1,3,5)	(1/5,1/3,1)
5	Much more important	(3,5,7)	(1/7,1/5,1/3)
7	Absolutely more important	(5,7,7)	(1/7,1/7,1/5)
2, 4, 6	Mid-point preference values lying between above values	(1,2,3), (3,4,5), (5,6,7)	(1/3,1/2,1), (1/5,1/4,1/3), (1/7,1/6,1/5)

Source: (see Wang, Chan and Li [44])

A comparison of pairs is performed using a ratio scale. The scale used is a nine-point scale with the use of TFNs. These numbers are used to indicate the relative strength of each pair of elements in the same hierarchy. The scores from the paired comparisons are transformed into linguistic variables [45], which are represented by TFNs. By using TFNs to compare pairs, the *fuzzy* judgment matrix $\tilde{A}$ can be mathematically expressed through Equation 1.

$$\tilde{A}=\begin{pmatrix} 1 & \tilde{a}_{12} & \tilde{a}_{13} & \dots & \tilde{a}_{1(n-1)} & \tilde{a}_{1n} \\ \tilde{a}_{21} & 1 & \tilde{a}_{23} & \dots & \tilde{a}_{2(n-1)} & \tilde{a}_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \tilde{a}_{(n-1)1} & \tilde{a}_{(n-1)2} & \tilde{a}_{(n-1)3} & \dots & 1 & \tilde{a}_{(n-1)n} \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \tilde{a}_{n3} & \dots & \tilde{a}_{n(n-1)} & 1 \end{pmatrix} \quad (1)$$

The judgment matrix $\tilde{A}$ is nxn and contains fuzzy $\tilde{a}_{ij}$ numbers, so it is represented by Equation 2.

$$\tilde{a}_{ij}=\begin{cases} 1, i=j \\ \tilde{1},\tilde{3},\tilde{5},\tilde{7},\tilde{9} or \tilde{1}^{-1},\tilde{3}^{-1},\tilde{5}^{-1},\tilde{7}^{-1},\tilde{9}^{-1}, i\neq j \end{cases} \quad (2)$$

$X=\{x_1,x_2,\dots,x_n\}$ is a set object, and $U=\{u_1,u_2,\dots,u_m\}$ the set of goals. The analysis can be performed with each object and its respective g_i goal resulting in m values for each object given target. That is $M_{gi}^1, M_{gi}^2,\dots,M_{gi}^m, i=1;\ 2\ \dots,n$, where all $M_{gi}^j (j=1;\ 22\dots,m)$ are TFNs representing the performance of the object x_i with respect to each u_j goal.

Detailed in the following is the method proposed by Chang (see Chang [38]), (used by Kahraman et al. [46], Kutlu & Ekmekçioğlu [47], Cho & Lee [48], Stefano et al. [49] among many other researchers). The steps to be followed for the application of FAHP are:

Step 1: To form comparisons of pairs of attributes using the *fuzzy* numbers, which consist of low, medium and higher values at the same level of the hierarchical structure.

Step 2: The value of the *fuzzy* synthetic extent with respect to the i^{th} object is defined by Equations 3, 4, 5, and 6:

$$S_i=\sum_{j=1}^{m}M_{gi}^j\otimes\left[\sum_{i=1}^{n}\sum_{j=1}^{m}M_{gi}^j\right]^{-1} \quad (3)$$

$$\sum_{j=1}^{n}M_{ij}=\left(\sum_{j=1}^{n}l_{ij},\sum_{j=1}^{n}m_{ij},\sum_{j=1}^{n}u_{ij}\right), i=1;2;3\dots,n \quad (4)$$

$$\sum_{i=1}^{m}\sum_{j=1}^{n}M_{gi}^j=\left(\sum_{i=1}^{m}\sum_{j=1}^{n}l_{ij},\sum_{i=1}^{m}\sum_{j=1}^{n}m_{ij},\sum_{i=1}^{m}\sum_{j=1}^{n}u_{ij}\right) \quad (5)$$

$$\left[\sum_{i=1}^{m}\sum_{j=1}^{n}M_{ij}\right]^{-1}=\left(\frac{1}{\sum_{i=1}^{m}\sum_{j=1}^{n}u_{ij}},\frac{1}{\sum_{i=1}^{m}\sum_{j=1}^{n}m_{ij}},\frac{1}{\sum_{i=1}^{m}\sum_{j=1}^{n}l_{ij}}\right) \quad (6)$$

Step 3: The degree of possibility of $M_2=(l_2,m,u_2)\geq M_1=(l_1,m_1,u_1)$ is set (Equation 7) as:

$$V(M_2\geq M_1)=sup_{y\geq x}\left[min\left(\mu_{M_2}(x),\mu_{M_2}(y)\right)\right] \quad (7)$$

In addition, it may be equivalent to Equation 8:

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_2}(d) = \begin{cases} 1; if\ m_2 \geq m_1 \\ 0; if\ l_1 \geq l_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, cc \end{cases} \quad (8)$$

Equation 8 takes the form of Equation 9.

$$d'^{(A_i)} = \min V(S_j \geq S_i) \quad (9)$$

For $k = 1;\ 2 \ldots; n; k \neq i$. Following the weight vector (Equation 10) is given by:

$$W' = \left(d'^{(A_1)}, d'^{(A_2)} \ldots, d'^{(A_n)}\right)^T \quad (10)$$

where $A_i (i = 1;\ 2 \ldots;\ n)$ has n elements.

Step 4: The level of possibility for a convex *fuzzy* number to be greater than k convex *fuzzy* numbers can be defined by Equation 11.

$$V(M \geq M_1, M_2 \ldots, M_k) = V[(M \geq M_1)] e(M \geq M_2) and \ldots and (M \geq M_k) = \min V(M \geq M_i), i = 1;2;3 \ldots; k \quad (11)$$

Step 5: through standardization, Equation 12 normalizes the weight vectors.

$$W = \left(d(A_1), d(A_2) \ldots, d(A_n)\right)^T \quad (12)$$

where W is a non-*fuzzy* number.

To compare M_1 and M_2 the values $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$ are needed.

Step 6: Calculation of overall weights [50-51] for the sub-criteria. The overall weights of sub-criteria are calculated by multiplying the weight of the sub-criteria with the weight of the criteria to which it belongs. The overall weights are denoted by $w_{sub}^i = (w_{i1}, w_{i2} \ldots, w_{ini})$, where n_i is the number of sub-criteria with respect to the i_n criterion.

4. Application of FDELPHI

Following is the first stage of the methodology used for evaluating the criteria and sub-criteria to the implementation of PSS, using the Fuzzy Delphi (FDELPHI) method. An initial questionnaire with 11 criteria and 91 sub-criteria (based on the literature and interviews with experts responsible for implementing the PSS). In total, 4 rounds were performed. After Step I the next (Step II) was the application of FAHP in a large company that is planning the implementation of PSS.

4.1. Application of FAHP

Step 1: The formation of the comparisons of pairs of attributes for the criteria was carried out using the fuzzy numbers. The same for the sub-criteria.

Step2: The value of the fuzzy synthetic measure initially performed for the criteria were:

$$\sum_{j=1}^{10} Sb_{g1}^j = (1,1,1) \oplus (1/7,1/7,1/5) \oplus \ldots \oplus (3,5,7) = (10.86,16.86,23.2)$$

$$\sum_{j=1}^{10} Sb_{g10}^j = (12,14,9.40)$$

$$\sum_{i=1}^{10}\sum_{j=1}^{10} M_{gi}^j = (10.86,16.86,23.2) \oplus (36.29,50,29,50.40) \oplus \cdots \oplus (12,14,9.40) = (216,283,300)$$

$$\left[\sum_{i=1}^{m}\sum_{j=1}^{n} M_{ij}\right]^{-1} = \left(\frac{1}{216}, \frac{1}{283}, \frac{1}{300}\right) = (0.003336, 0.003533, 0.004629)$$

The same procedure was performed for the sub-criteria.

Step 3: The degree of possibility of $S_i = (l_j, m_j, u_j) \geq S_i = (l_i, m_i, u_i)$ can be calculated by comparing the values of S_i. The minimum degree of possibility is calculated by $d'(i)$ of $V(S_j \geq S_i)$ for $i; j = 1;\ 2;\ 3\ \ldots;\ k$:

$$\left.\begin{aligned} S_3(Sb_3) &= (0.1219340, 0.1776960, 0.2333020) \\ S_8(Sb_8) &= (0.0892750, 0.1115370, 0.1703470) \end{aligned}\right\}$$

$$V(S1 \geq S2) = \frac{0.1219340 - 0.1703470}{(0.1115370 - 0.1703470) - (0.1776960 - 0.12193400.13983)} = 0.42$$

The results for the degree of possibility for the criteria and sub-criteria.

Step 4: as a result, we obtained the following weight vector (criteria): $(0.10,0.59,0.19,0.55,0.38,0.38,1,0.37,0.41,1)^T$. The same procedure was performed for the sub-criteria.

Step 5: Normalization of weights. After the normalization of the value of these weights with respect to the main goal, the results are the following:

$W = (0.060,0.105,0.178,0.133,0.081,0.070,0.050,0.112,0.154,0.050)$

Step 6: Calculation of the global weight of the sub-criteria. Table 3 shows the results for all sub-criteria.

Table 3. Global weights for sub-criteria

Criteria	Sub-criteria	Local Weight	Local Weight (%)	Global weight	Global weight (%)
	Sc_1	0.1020	10.20	0.0061	0.61
	Sc_2	0.1200	12.0	0.0072	0.72
C_1	Sc_3	0.1115	11.15	0.0067	0.67
(0.0602)	Sc_4	0.1200	12.00	0.0072	0.72
	Sc_5	0.0900	10.00	0.0054	0.54
	Sc_6	0.2200	22.00	0.0132	1.32
	Sc_7	0.2400	24.00	0.0144	1.44
C_2	Sc_8	0.1458	14.58	0.0155	1.55
(0.1062)	Sc_9	0.1200	12.00	0.0127	1.27
	Sc_{10}	0.2300	23.00	0.0244	2.44
	Sc_{11}	0.1933	19.33	0.0205	2.05
	Sc_{12}	0.1311	13.11	0.0139	1.39
	Sc_{13}	0.1800	18.00	0.0191	1.91
C_3	Sc_{14}	0.1987	19.87	0.0354	3.54
(0.1780)	Sc_{15}	0.1884	18.84	0.0335	3.35
	Sc_{16}	0.1641	16.41	0.0292	2.92
	Sc_{17}	0.1852	18.52	0.0330	3.30
	Sc_{18}	0.1685	16.85	0.0300	3.00
	Sc_{19}	0.0960	9.60	0.0171	1.71
C_4	Sc_{20}	0.2003	20.03	0.0266	2.66
(0.1326)	Sc_{21}	0.1801	18.01	0.0239	2.39
	Sc_{22}	0.1145	11.45	0.0152	1.52
	Sc_{23}	0.1558	15.58	0.0207	2.07
	Sc_{24}	0.1042	10.42	0.0138	1.38
	Sc_{25}	0.1751	17.51	0.0232	2.32
	Sc_{26}	0.0700	7.00	0.0093	0.93
C_5	Sc_{27}	0.1507	15.07	0.0123	1.23
(0.0814)	Sc_{28}	0.1905	19.05	0.0155	1.55
	Sc_{29}	0.2409	24.09	0.0196	1.96

Criteria	Sub-criteria	Local Weight	Local Weight (%)	Global weight	Global weight (%)
	Sc_{30}	0.2634	26.34	0.0214	2.14
	Sc_{31}	0.1584	15.84	0.0129	1.29
C_6	Sc_{32}	0.2482	24.82	0.0176	1.76
(0.0708)	Sc_{33}	0.2133	21.33	0.0151	1.51
	Sc_{34}	0.1706	17.06	0.0121	1.21
	Sc_{35}	0.0658	6.58	0.0047	0.47
	Sc_{36}	0.1034	10.34	0.0073	0.73
	Sc_{37}	0.2014	20.14	0.0143	1.43
C_7	Sc_{38}	0.3115	31.15	0.0154	1.54
(0.0496)	Sc_{39}	0.3300	33.00	0.0164	1.64
	Sc_{40}	0.2200	22.00	0.0109	1.09
	Sc_{41}	0.1412	14.12	0.0070	0.70
C_8	Sc_{42}	0.2536	25.36	0.0287	2.87
(0.1133)	Sc_{43}	0.2412	24.12	0.0273	2.73
	Sc_{44}	0.2388	23.88	0.0271	2.71
	Sc_{45}	0.2671	26.71	0.0303	3.03
C_9	Sc_{46}	0.3608	36.08	0.0555	5.55
(0.1538)	Sc_{47}	0.0984	9.84	0.0151	1.51
	Sc_{48}	0.1987	19.87	0.0306	3.06
	Sc_{49}	0.0658	6.58	0.0101	1.01
	Sc_{50}	0.1800	18.00	0.0277	2.77
	Sc_{51}	0.0965	9.65	0.0148	1.48
C_{10}	Sc_{52}	0.2500	25.00	0.0124	1.24
(0.0496)	Sc_{53}	0.2871	28.71	0.0142	1.42
	Sc_{54}	0.2612	26.12	0.0129	1.29
	Sc_{55}	0.2022	20.22	0.0100	1.00

The criteria C_3 (Restructuring) had the high weight (17.80%), C_9 (Assurance) (15.38%) and C_4 (Innovation and Technology) 13.26%. I.e., the more influence in implementation of PSS. The sub-criteria (Table 6) with greater Local weight were "Sc_{46} (learning and understanding of the requirements of necessity and customer satisfaction – Assurance) (36.08%)"; "Sc_{39} (company always provide the best service to the customer – Empathy)" 33.00%, Sc_{53} (reduce waiting time to receive the service – Communication), 28.71%, and Sc_{45} (access to information of the product-service performance during use – Communication).

As for the global weight of the sub-criteria, the following are highlighted: Sc_{46} (learning and understanding of requirements of necessity and customer satisfaction – Assurance) (5.55%)"; Sc_{14} (the PSS concept must be consistent with the firm's strategic orientation – Restructuring) (3.54%); Sc_{15} (creation of a project team to perform the PSS design activities – Restructuring) (3.35%), Sc_{17} (Perceptions, management and formal process for setting quality goals – Restructuring) (3.30%).

Therefore, one can see that the relevant criterion was "Restructuring". It shows that for the implementation of such a system the organization needs to review its present management, policies, goals and routines.

5. Conclusions

This paper aimed to evaluate the main criteria and sub-criteria for the implementation of the PSS (from the point of view of operations), through a fuzzy methodology. Initially, we used the fuzzy Delphi to validate (with experts) the criteria and sub-criteria for the implementation of SSP through a questionnaire (based on the quality dimensions) elaborated on from the literature. Next, it was applied to a large company that is planning to implement PSS. Four rounds were carried out until they reached the end questionnaire (10 criteria and 55 sub-criteria). It was observed through data the need that organizations must review their management for the implementation of PSS. Therefore, barriers and challenges in implementation of PSS certainly exist, and range from resistance of the companies to take on more responsibility and the necessary competence grace. Also, consumer resistance in not understanding or accepting the non-ownership of the property. In addition, especially on perceived value, as it passes from the tangible to the intangible. As for suggestions for future research, it is recommended that application of the research be from the client's point of view.

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